**P425/2 APPLIED MATHEMATICS**

**TIME: 1HOUR** **S.6**

**Do all questions:**

**In numerical work take g = 9.8ms $^{-2}$**

**SECTION A: (40 MARKS)**

1. A constant force of 35N acting horizontally causes a particle of mass 2 kg to move over a rough horizontal plane. The particle passes two points A and B, 5m apart with speeds of 5ms$^{-1}$ and 10ms$^{-1}$ respectively. Find the magnitude of the frictional resistance. (5 marks)

2. The probability that John speaks the truth is $\frac{3}{5}$ and that of Peter is $\frac{5}{8}$. find the probability that they are likely to contradict each other on an identical issue. (5 marks)

3. The area $\Delta$ of a triangle ABC is given by $\Delta = \frac{1}{2}$bcSinA, where A is the angle between the sides b and c. Find the percentage error made in the area if b = 24mm, c = 42 mm each measured to the nearest mm and the angle A = $60^o$ with an error of $\pm 0.5^o$

4. Eight applicants for a certain job obtained the following marks in oral and written tests.

| Applicant | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| Oral test | 15 | 20 | 28 | 12 | 40 | 60 | 20 | 80 |
| Written test | 40 | 30 | 50 | 30 | 20 | 10 | 30 | 60 |

Calculate a rank correlation coefficient of the applicants' performance in the two tests.

Comment on your result. (5 marks)

5. (a) A function f(x) is defined as shown in the table below;

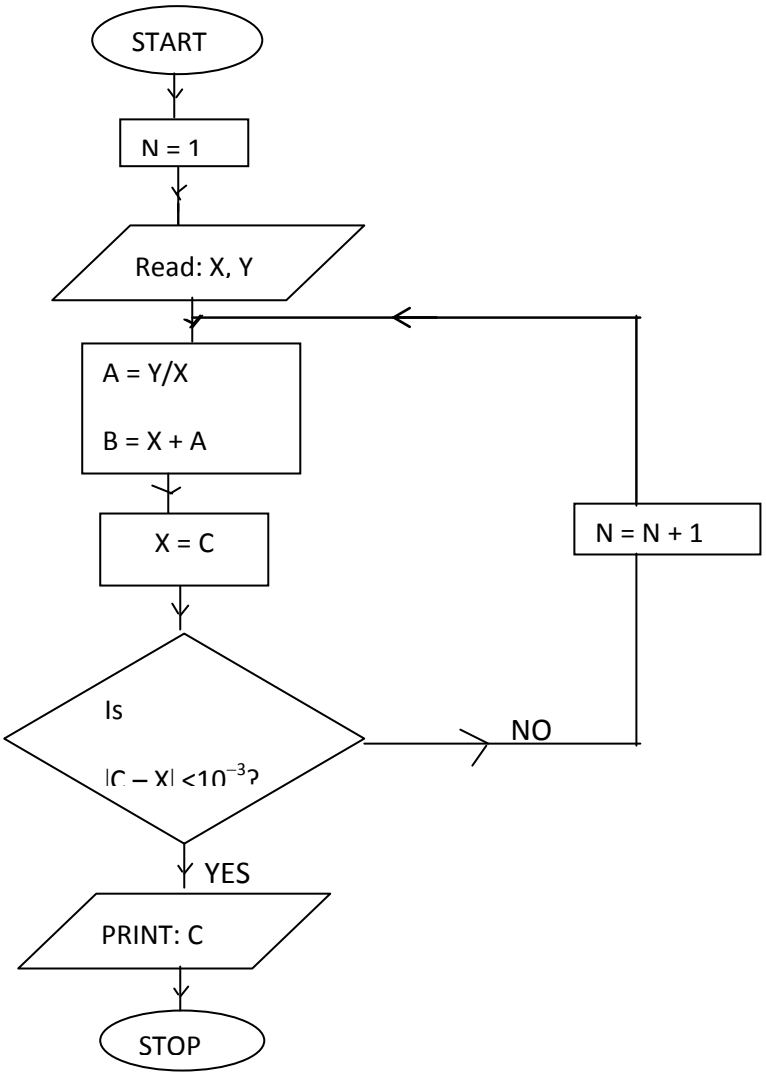
| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| f(x) | 0.1708 | 0.1679 | 0.1650 | 0.1622 |

Use linear interpolation/extrapolation to determine

(i) f(4.8)

(ii) x if f(x) = 0.1685

6. Study the flow chart below;




(i) Perform the dry run of the flow chart for Y = 60 and X = 7.

(ii) State the purpose of the flow chart.

**SECTION B**

7. At a certain fuel station, 30% of the customers buy SUPER(S), 60% buy REGULAR (R) and the remainder DIESEL (D). Of those who buy S, 25% fill the tank, 80% do not fill the tank with D, 70% fill their tank with (R).

(i) Find the probability that when a vehicle leaves the station, it does not have a full tank.

(ii) Given that a vehicle has a full tank, determine the probability that the tank contains regular fuel.

8. (a) Use the trapezium rule with 6 ordinates to estimate

$\int_0^1 \frac{dx}{\sqrt{3-2x}}$, correct to 3 decimal places. (6 marks)

(b) Find the percentage error made in your estimation, giving your answer to 2 decimal places. Suggest how this error may be reduced. (6 marks)

9. The table below shows the marks that were scored by 400 candidates who attended a mathematics contest and the maximum mark was 99.

| Marks | No of candidates |
|---|---|
| 0 – 9 | 10 |
| 10 – 19 | 26 |
| 20 – 29 | 42 |
| 30 – 39 | 66 |
| 40 – 49 | 83 |
| 50 – 59 | 71 |
| 60 – 69 | 52 |
| 70 – 79 | 30 |
| 80 – 89 | 14 |
| 90 – 99 | 6 |

(a) Calculate the mean and modal mark of the candidates

(b) (i) Construct a cumulative frequency curve and use your curve to estimate the median and the $20^{th}$ percentile.

(ii) If the minimum mark for Grade A was fixed at 74, estimate from your curve the percentage of candidates obtaining Grade A.

10. A tennis player hits a ball at a point O, which is at a height 2m above the ground and at a horizontal distance 4m from the net, the initial speed being in the direction $45^{o}$ above the horizontal in a vertical plane perpendicular to the net which is 1m high.

(a) show that the equation of the path of the ball is y = $x - \frac{5x^2}{16}$

(b) Find the distance from the net at which the ball strikes the ground.
($g = 10ms^{-2}$)

**END**